said period, d, is established by selecting any two positive integers s and p, such that s > p, and any arbitrary internal angle of incidence, α, calculating the internal angle of diffraction, β, with the following equation:

$$\beta = \text{either } a\cos\left(\frac{2p-1}{2s-1}\right) - \alpha \quad \text{or} \quad 180 - a\cos\left(\frac{2p-1}{2s-1}\right) - \alpha$$

and using the following equation:

$$d = \frac{\lambda}{n(\sin\alpha + \sin\beta)},$$

where λ is the nominal free-space wavelength for which said enhanced volume phase grating is designed,

$[\alpha + \beta = 2\theta$ and$]$

$[2\theta = \text{either } a\cos\left(\frac{2p-1}{2s-1}\right)$ degrees or $180 - a\cos\left(\frac{2p-1}{2s-1}\right)$ degrees,$]$

[where s and p are integers and s > p > 0,]

and said peak modulation, Δn, of said bulk refractive index is obtained from the following equation:

$$\Delta n = \frac{\lambda}{T}\left(\frac{2s-1}{2}\right)\sqrt{(\cos\alpha)\left(\cos\alpha - \frac{\lambda}{nd}\tan\left(\frac{\beta-\alpha}{2}\right)\right)},$$

$$[\Delta n = \frac{\lambda}{T}\left(\frac{2s-1}{2}\right)\sqrt{C_R C_S},]$$

[where $C_R = \cos\alpha$ and $C_S = \cos\alpha - \frac{\lambda}{nd}\tan\left(\frac{\beta-\alpha}{2}\right)$;]

values of said bulk refractive index, n, and said peak modulation, Δn, being established using well known exposure and processing procedures for said volume phase medium;

whereby the S-polarization diffraction efficiency and the P-polarization diffraction efficiency of said enhanced volume phase grating, when illuminated by an incident beam of said nominal free-space wavelength, λ, at [an] said internal angle of incidence, α, are simultaneously maximized at a common value of the product ΔnT, thereby simultaneously minimizing insertion loss and PDL in a highly dispersive volume phase grating.

10. The enhanced volume phase grating of claim 9 wherein said volume phase medium is dichromated gelatin.

11. The enhanced volume phase grating of claim 9 wherein said index modulation, Δn, of said volume phase medium is greater than 0.1, and preferably on the order of 0.2, thereby decreasing Bragg angle sensitivity.

12. The enhanced volume phase grating of claim 9 wherein said rigid support means is a transparent medium[, such as glass or fused silica,] and said transparent cover means is a similar or identical transparent medium.

13. The enhanced volume phase grating of claim 12 further including a reflective means to reflect the diffracted beam back toward and into said enhanced volume phase grating.

14. The enhanced volume phase grating of claim 12 wherein the external surfaces of said transparent medium and said transparent cover means are coated with an anti-reflection coating such that the overall loss for the S-polarized light and the overall loss for the P-polarized light are minimized and substantially equal at said nominal free-space wavelength.

15. The enhanced volume phase grating of claim 12 wherein the external surfaces of said transparent medium and said transparent cover means are coated with an anti-reflection coating such that the overall loss for the S-polarized light is somewhat greater than the overall loss for the P-polarized light at said nominal free-space wavelength, thereby minimizing the [worst case] maximum PDL.

16. The enhanced volume phase grating of claim 12 wherein the external surfaces of said transparent medium and said transparent cover means are coated with an anti-reflection coating such that the overall loss for the S-polarized light is somewhat greater than the overall loss for the P-polarized light after two passes through said enhanced volume phase grating at said nominal free-space wavelength, thereby minimizing the [worst case] maximum PDL in a two-pass design.